

**REMARKS**

Claims 1-29 were pending prior to the present amendments.

Claims 1-3, 5, 6, 8 and 10-13 are allowed.

Claims 4, 5, 7, 9, 10, 16-20, and 22-29 are amended herein.

Claim 21 is canceled.

All are patentable for, at least, the reasons set forth herein.

**REJECTIONS UNDER 35 U.S.C. 112**

Claims 4, 7, 9 and 14-29 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Office specifically states that claims 4, 9, 14 and 15 are indefinite since claim 1 teaches that the copper ions are part of a complex, but these claims teach that the copper ions are part of copper (I) chloride, and that it is unclear how the copper ions can be part of both, especially since the copper is monovalent. The Examiner further states that: it is noted that page 5 of the specification teaches the complex is formed by combining a solution containing copper chloride and a citrate or EDTA salt.

Claims 4 and 9 have been amended to teach that the citrate of EDTA complex of copper ions is prepared by combining copper (I) chloride with a citrate or an EDTA salt as is to be found in

the application as filed at page 5, lines 9-13, thereby conforming with the requirements of 35 U.S.C. §112, second paragraph. As a result of these amendments to claims 4 and 9, claims 14, 18 and 23 dependent on claims 4 and 9 thereby also conform with the requirements of 35 U.S.C. §112, second paragraph.

Claim 21 is canceled thereby rendering all rejections directed thereto moot.

The Office opines that claims 7, 16-19, 21-24 and 26-28 are all duplicates of each other, since the process limitations of claims 2-5, 8-10, 12 and 14 do not affect the produced ZnS:Cu. This means that the ZnS:Cu produced by the processes of claims 2-5, 8-10 and 14 is identical to that produced in claim 1.

Applicants respectfully submit that the rejection is improper and traversed for the reasons set forth herein.

The process of claim 1 teaches any method of mixing a zinc salt, a sulfide and a citrate or EDTA complex of copper ions, dissolved in several aqueous solutions leading to precipitation of zinc sulfide particles doped with copper (ZnS:Cu), variations in the ingredients chosen and in the valency state of the salts or complexes used. Such variations will have an impact on the way in which the copper ions are incorporated into the zinc sulfide e.g. the valency state of the copper ions, the microscopic distribution of copper ions, the particle

morphology, the particle size, the particle size distribution, the surface and surface roughness of the particles, etc. These microscopic effects will be reflected in the variations in the macroscopic properties of the resulting copper-doped zinc sulfide particles e.g. the wavelength, wavelength distribution and light intensity emitted by the copper-doped zinc sulfide particles and the emission lifetime of the particles. Claims 2 and 16 disclose a particular precipitation technique, namely the double jet principle, claims 3, 8, 17 and 22 disclose that the copper ions are monovalent copper ions, claims 4, 9, 18 and 23 disclose a particular method of preparing the citrate or EDTA complex of copper ions, claim 5, 10, 12, 14, 19, 24, 26 and 28 disclose the subjection of the copper-doped zinc sulfide particles to diafiltration and/or ultrafiltration thereby removing water-soluble impurities and claims 6, 11, 13, 15, 20, 25, 27 and 29 disclose the use of a compound to prevent agglomeration of the copper-doped zinc sulfide particles. We therefore contend that claims 2-6, 8-20 and 22-29 conform with the requirements of 35 U.S.C. §112, second paragraph.

PROVISIONAL OBVIOUSNESS-TYPE DOUBLE PATENTING REJECTIONS

Claims 7 and 16-20 are rejected on the basis of a provisional obviousness-type double patenting rejection as being unpatentable over claims 1, 5-7 and 13 of copending Application

No. 10/50,243 or U.S. Patent Application Publication  
2002/151094.

A terminal disclaimer is filed herewith thereby rendering the rejection moot.

Claims 7 and 16-20 are rejected on the basis of a provisional obviousness-type double patenting rejection as being unpatentable over claims 1, 5, 7, 8 and 14 of copending Application No. 10/50,667 or U.S. Patent Application Publication 2002/153830.

A terminal disclaimer is filed herewith thereby rendering the rejection moot.

REJECTIONS UNDER 35 U.S.C. 103

Claims 7 and 16-29 are rejected under 35 U.S.C. §103(a) as being unpatentable ove Gray et al. in view of Fischer.

Gray et al.

Gray et al. in claim 1 discloses that:

"A method of producing monodispersed doped nanocrystalline phosphors, said doped phosphors comprising a compoinid formed as the reaction product of two or more reactants, comprising the steps of:

forming a bicontinuous cubic phase including interconnected mesoporous cavities, said mesoporous cavities housing at least one and less than all of said reactants from which said compound is formed, said bicontinuous cubic phase

being nonreactive with respect to all of said reactants;  
diffusing the remainder of said reactants into said mesoporous cavities;  
allowing said reactants to react, within said mesoporous cavities and in the presence of a dopant ion, to form doped nanocrystalline phosphors, said mesoporous cavities being of a diameter that limits the size of said doped nanocrystalline phosphors formed therein to no greater than about 30 nm in diameter, the concentration of said dopant during said formation of said doped nanocrystalline phosphors being such that said formed doped nanocrystalline phosphors have an average of about one or less dopant ions per nanocrystalline phosphor particle."

Gray et al. only exemplifies ZnS:Mn phosphors. The only allusion to the possibility of applying the process of claim 1 of Gray et al. to phosphors other than ZnS:Mn is to be found at col. 5, lines 24-34, which discloses that:

"Some examples of host-activator/dopant pairs according to the method of the present invention include: ZnS:Mn; ZnS:Cu,Mn; ZnS:Cu; ZnS:Ag; ZnS:Cu,Cl; ZnS:Eu; ZnS:Cu,Tb; ZnS:Tb; ZnS:Ag,Cl; ZnS:Cu,Al; Zn<sub>x</sub>Cd<sub>1-x</sub>S:Mn; Zn<sub>x</sub>Cd<sub>1-x</sub>S:Ag,Cl; Zn<sub>x</sub>Mg<sub>1-x</sub>S:Mn; SrS:Mn; SrS;Ce; CaS:Mn; CaS:Er,Cl; CaS:Tb; and ZnO:Zn. Other possible phosphors that may be made according to the present invention include: ZnS:Cu,Mn; ZnS:Cu; ZnS:Ag; ZnS:Cu,Cl; ZnS:Eu; ZnS:Cu,Tb; ZnS:Tb; ZnS:Ag,Cl; ZnS:Cu,Al; Zn<sub>x</sub>Cd<sub>1-x</sub>S:Mn; Zn<sub>x</sub>Cd<sub>1-x</sub>S:Ag,Cl; Zn<sub>x</sub>Mg<sub>1-x</sub>S:Mn; SrS:Mn; SrS;Ce; CaS:Mn; CaS:Er,Cl; CaS:Tb."

Applicants opine that since the process of Gray et al. has only been exemplified for one phosphor, namely ZnS:Mn, that there is no enablement for the use of the process of Gray et al.

with its very specific process characteristics for the preparation of phosphors other than ZnS:Mn i.e. references to phosphors other than ZnS:Mn cannot be regarded as disclosing such phosphors prepared by the process according to Gray et al.

Fischer in claim 1 discloses:

"A display panel comprising a body of insulating resin having a layer of electroluminescent particles embedded therein, said layer being a single particle in thickness, said resin having a dielectric constant higher than that of said particles and said resin including fluorescent material on at least one side of said layer, insulating coatings on both front and back surfaces of said resin body, a transparent front electrode extending over the insulating coating on said front surface, a back electrode disposed on the insulating coating on said back surface, at least one element of said display panel adjacent the back thereof being black and sufficiently opaque to absorb substantially all the light reaching it, and means for electrically energizing said electrodes."

However, at col. 12, lines 20-43, Fischer discloses:

"In the past, recipes for white-emitting EL powders have been published. We found, however, that these white-emitting ZnS:Cu,Mn powders increase the color temperature of their white emission as the drive frequency is increased. Above 5 kHz drive frequency, they fail altogether since the yellow ZnS:Mn emission band saturates whereas the blue ZnS:Cu,Cl band of the emission keeps becoming brighter. However, as explained before, in order to obtain high brightness it is very desirable to drive these panels at frequencies as high as possible, for example, at 10 kHz."

According to the present invention, there are several solutions to this problem. We found that a white-emitting

mixture can be prepared which has high brightness at 10 kHz and which is insensitive to changes of the drive frequency. It consists of an intimate physical mixture of either blue-emitting ZnS:Cu,I or blue-emitting ZnS:Cu,Al phosphor powder, with yellow-emitting  $ZnS_{0.2}Se_{0.8}:Cu,Al$  powder, in the ratio of 30 to 70 weight percent. By increasing the blue proportion, cool-white emission can be obtained, by increasing the yellow proportion, warm-white emission is achievable quite easily.

This clearly teaches away from the use of ZnS:Cu phosphors in the display panel comprising a body of insulating resin having a layer of electroluminescent particles embedded therein as set forth in Fischer. Moreover, the luminescence properties of control examples disclosed in the present application (Examples 1 to 3) prepared according to standard precipitation process are significantly inferior to those of the invention examples of the present application prepared according to the process of the present invention. We contend that such differences in properties reflect differences in the phosphors and hence that significantly different ZnS:Cu phosphors are realized according to the present invention with significantly better luminescence properties with respect to prior art ZnS:Cu phosphors.

We therefore contend that claims 7 and 16-20 and 22-29 are patentable under 35 U.S.C. §103(a) over Gray et al. in view of Fischer.

## CONCLUSIONS

Claims 1-20 and 22-29 are pending in the present application. All claims are in condition for allowance and notice thereof is respectfully requested.

Respectfully submitted,



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